

DOCUMENT RESUME

ED 357 558

EC 302 101

AUTHOR Brigham, Frederick J.
TITLE Places, Spaces and Memory Traces: Showing Students with Learning Disabilities Ways to Remember Locations and Events on Maps.
PUB DATE Apr 93
NOTE 10p.; Paper presented at the Annual Conference of the Council for Exceptional Children (71st, San Antonio, TX, April 5-9, 1993).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Geography; *Instructional Effectiveness; Intermediate Grades; Junior High Schools; *Learning Disabilities; *Learning Strategies; *Maps; *Memorization; Middle Schools; *Mnemonics; Revolutionary War (United States); Teaching Methods

ABSTRACT

This study examined the memory-enhancing effects of elaborative and mnemonic encoding of information presented with maps, compared to more traditional, non-mnemonic maps, on recall of locations of events and information associated with those events by 72 middle school students with learning disabilities. Subjects were presented with map-like displays containing names of battles of the American Revolution and related factual information via either: (1) a non-mnemonic control map with realistic drawings of buildings, soldiers, weapons, etc. found in the time period; (2) a mnemonic map with mnemonic-keywords of verbal labels; or (3) an elaborative map with reconstructive elaborations of the verbal labels and event information. Findings indicated that recall of location was significantly enhanced by mnemonic keyword encoding of verbal labels, that mnemonic encoding of location labels produced no significant gain in recall of related factual information, that locations were more often recalled than events, that only elaborative encoding resulted in a significant difference in the conditional probability of associating events with their locations, and that mnemonic strategy use was positively and significantly correlated with recall measures. Battle names, associated information, keywords, and elaborations are listed on an attachment. (DB)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED357558

SC
U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official
OERI position or policy.

Places, Spaces and Memory Traces:
Showing Students with Learning Disabilities Ways to Remember
Locations and Events on Maps

Frederick J. Brigham
Valparaiso University
Valparaiso, IN

April, 1993

EC 302101
Paper presented at the annual meeting of The Council for Exceptional Children,
San Antonio, TX

Running head: Elaborative Maps

PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

*Frederick J.
Brigham*

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

The support and assistance of Thomas E. Scruggs and Margo A. Mastropieri of Purdue University in the completion of this project is gratefully acknowledged. Partial support for this project was provided by grants (G008730144-89 and H029D80034) awarded to Drs. Scruggs and Mastropieri.

Purpose

This study was designed to examine the ability of spatial displays such as maps to convey unfamiliar and abstract information to students with learning disabilities (LD). Names of battles of the American Revolution and events associated with those battles were chosen as the to-be-taught information in this study.

Learning From Maps in General Education Settings

One of the learning tasks included in many mainstream social studies classes is reading and interpreting maps. The importance of map reading is underscored by the prominence given to maps in many textbooks. For example, one commonly used American history text, Land of Liberty (Rawls & Weeks, 1985), presents six different maps requiring individuals to remember the locations and names of various natural physical features as well as the locations and names of various aspects of human activity such as territorial homes of Native American peoples in the first chapter alone. Many mainstream social studies classes require students to label maps with names of cities and events as well as associate events with their respective sites.

Previous research (e.g., Dean, 1978; Schwartz & Kulhavy, 1981) found that maps may serve as a spatial organizer enhancing both the recall of locations and related prose.

Potential Map-Learning Problems for Students with LD

Theories of perceptual difficulty and more current theories of verbal deficiencies suggest that learning and recall of information presented with maps may be particularly difficult for students with LD. Perceptual deficit theories predict the spatial characteristics of the map to be problematic. However, if verbal deficiencies are more characteristic of students with LD, one would expect the extent to which the verbal labels of the information were abstract and unfamiliar to be problematic for students recalling information portrayed on maps.

Previous Map-learning Studies with Students with LD

Mastropieri & Peters (1987) compared recall of information presented pictorially in a map-like spatial display and in a column. Significantly more items were recalled in the map condition than in the column condition. Items depicted on the map were recalled more frequently than items associated with map conditions but not depicted on the map.

Scruggs, Mastropieri, Brigham, & Sullivan (1992) employed mnemonic keyword encoding of 18th century American battle names and color-coding of the victors compared to traditional map displays using depictions of period images to mark the battles and color-coding for the victors. Recall of map locations and victors was significantly greater with mnemonic maps than with traditional maps.

Remaining Questions

Previous studies showing the positive benefits of spatial displays of information on maps have typically employed information which is relatively concrete and familiar to the subjects. Similar outcomes with abstract and unfamiliar information for populations with learning disabilities (LD) may be less likely. This study, therefore, investigated the memory-enhancing effects of elaborative and mnemonic encoding of information presented with maps to more traditional, non-mnemonic maps on recall of locations of events and information associated with those events by students with LD.

Specific questions

1. What are the effects of symbolic, mnemonic and spatial encoding on relocation of map features?
2. What are the effects of symbolic, mnemonic and spatial encoding on recall of events associated with the locations on the map?
3. Will manipulation of encoding of information on the map result in changes in the conditional probability of association of locations and associated events?
4. What strategies will students employ in the map relocation and recall of information tasks?

Method

Map-like displays containing names of battles of the American Revolution and related factual information regarding the battle were presented to 72 middle school students enrolled in programs for students with LD.

Materials

Three map conditions were employed to examine the effects of mnemonic encoding and reconstructive elaborations relative to a non-mnemonic map (Brigham, 1992).

1. Non-mnemonic control map with realistic drawings of buildings, soldiers, weapons, etc. found in the time period,
2. Mnemonic map with mnemonic-keywords of verbal labels, and
3. Elaborative map with reconstructive elaborations of the verbal labels and event information.

Procedure

One of three maps and an accompanying oral passage naming each location and describing a factual event related to the location were presented to the subjects individually. Next a brief distractor task, designed to prevent rehearsal was provided. Finally, subjects were asked to indicate the location of each battle by name and to recall any information they could relative to that battle on a test map with an empty box at each location. A 3 organization by 2 recall measure (location vs. event information) Analysis of Variance was conducted on the resulting data.

Results

Descriptive Data

Means and standard deviations calculated for each of the primary variables, recall of location and recall of event information are presented on Table 1. There were 24 subjects in each group.

Inspection of the mean and standard deviations for the groups reveals that the mnemonic and elaborative group attained higher mean scores for both variables compared to the control group. Evidence of a floor effect is present in the control and mnemonic groups for the variable, Event Recall. Due to the constrained variance indicated by the floor effects, nonparametric statistics were employed to confirm parametric statistics.

Table 1
Mean Scores and Standard Deviations for Recall of Location and Event Information

Variable		Group		
		Control	Mnemonic	Elaborative
Location	Mean	2.88	6.03	5.58
	(SD)	(2.15)	(2.83)	(2.92)
Event	Mean	0.42	1.29	3.71
	(SD)	(0.58)	(1.46)	(2.58)

Map Relocation

Significant differences were found between the means of the experimental groups for location ($p = .0001$). Multiple comparisons for recall of location indicated that the mnemonic and elaborative groups did not differ from each other but were both significantly greater than the control group. Figure 1 presents a plot of the means for correct recall of location by group.

Recall of Event Information

Significant differences were found between the means of the experimental groups for location ($p < .0005$). Multiple comparisons indicated that recall of event information was significantly greater for the elaborative group than the mnemonic or control groups which did not differ significantly from each other. Figure 2 presents a plot of the means for correct recall of event information by group.

Figure 1: Locations

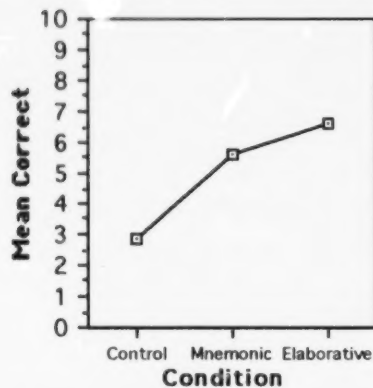
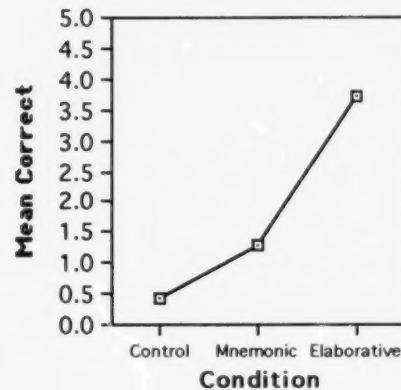


Figure 2: Events



Association of Location and Event-Information

Significant differences between location and event recall were found in each group. Figure 3 presents a plot of the means for recall of location and event information by group.

The strength of association for the elaborative group was significantly greater than either the mnemonic or control groups which did not differ significantly from each other. Mnemonic and elaborative subjects recalled event information correctly more often after a correct than incorrect location. Conditional probabilities were virtually the same for control subjects. Table 2 presents mean conditional probabilities and standard deviations.

Strategy Reports

Subjects reported using prior knowledge, verbal rehearsal, visual reconstruction, mnemonics, and no strategy. The mnemonic strategy (reported only by mnemonic and elaborative subjects) was significantly and positively correlated with recall ($r = .44$ for location, $.36$ for events). Reports of "no strategy" were significantly and negatively correlated with recall ($r = -.26$ for locations, $-.26$ for events). Other strategies were nonsignificantly though negatively correlated with recall.

Figure 3:
Association of Variables

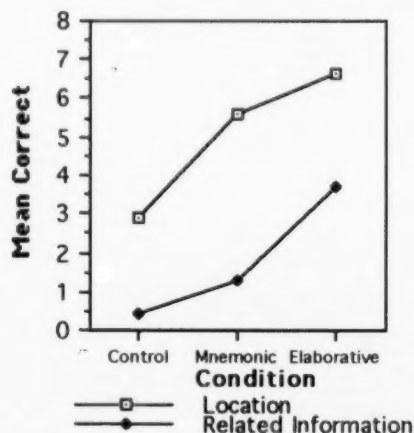


Table 2:
Conditional Probabilities

Probability	Condition		
	Control	Mnemonic	Elaborative
$P(C_I C_I)$	.1584	.1665	.6229
SD	.2537	.1658	.2798
$P(C_I W_I)$	.0494	.0957	.2868
SD	.0640	.2106	.2236

Conclusions

1. Recall of location was significantly enhanced by mnemonic keyword encoding of their verbal labels.
2. Mnemonic encoding of location labels produced no significant gain in recall of information regarding the events at the various locations.
3. Locations were more often recalled than events.
4. Only elaborative encoding resulted in a significant difference in the conditional probability of associating events with their locations.
5. Mnemonic strategy use was positively and significantly correlated with recall measures. Using no strategy was negatively and significantly correlated with recall measures.

Instructional Implications

Maps and spatial displays containing abstract and unfamiliar information do not appear as likely to promote recall as those in previous studies. The features on this map were all the same kind of thing (battles) and thus did not lend themselves to encoding of locations and events. Therefore, inclusion of a content-dependent strategy such as elaborative encoding in spatial displays may be expected to enhance recall of features and feature-related information.

References

- Brigham, F.J. (1992). Enhancing recall of information presented with maps by individuals with learning disabilities (Doctoral dissertation, Purdue University, West Lafayette, IN). University Microfilms 9229091.
- Dean, R. S. (1978). The influence of spatial organization in prose learning. Dissertation Abstracts International, 39, 408B. (University Microfilms No. 78-10, 568).
- Mastropieri, M. A. & Peters, E. E. (1987). Increasing prose recall of learning disabled and reading disabled students via spatial organizers. Journal of Educational Research, 80, 272-276.
- Rawls, J. J. & Weeks, P. (1985). Land of liberty: A United States history. New York: Holt, Rinehart and Winston.
- Schwartz, N. H. & Kulhavy, R. W. (1981). Map features and the recall of discourse. Contemporary Educational Psychology, 6, 151-158.
- Scruggs, T.E., Mastropieri, M.A., Brigham, F.J. & Sullivan, G.S. (1992). The effect of mnemonic reconstructions on the spatial learning of adolescents with learning disabilities. Learning Disability Quarterly, 15, 154-162.

Battle Names, Associated Information Taught, Keywords, and Elaborations

Battle	Associated Information	Keyword	Elaboration
Ticonderoga	They captured canon which would be used later.	Tiger	Tiger firing a cannon
Saratoga	After Saratoga, the French helped them.	Sarah, wearing toga	Sarah, wearing a toga and eating french fries.
Cowpens	They hid behind a hill for an ambush.	Cow	Cow hiding behind a hill (peeking over).
Dorchester	They made the enemy ships leave the harbor.	Door	Ship sailing out a door.
Trenton	They attacked on Christmas night.	Tent	Tents with a decorated Christmas Tree
Brandywine	They stopped an attack on the capitol.	Brandy	Colonist hitting a brandy jug on a stop sign.
Princeton	They kept fires burning so the enemy would think they were still in camp.	Prince	A prince sitting beside a campfire
Vincennes	They waded through a flood to get to the battle.	Fence	Fence surrounded by flood waters
Kakaskia	The enemy ran out of supplies.	Basket	Soldier looking in an empty supply basket.
Cahokia	Fought at the site of a large Indian mound.	Choke.	Person sitting on an Indian mound and choking
Yorktown	Last major battle of the war.	Fork	Fork flying a white flag of surrender.
Camden	They were sick because of bad food.	Camel	Sick looking camel eating at a cook pot with a skull and crossbones rising from it.
Paoli	They were attacked while they were sleeping.	Pay check	Sleeping soldier dreaming of a paycheck.
Germantown	They started shooting at each other in the fog.	Worms	Two worms surrounded by a cloud of fog pointing rifles at each other.

Examples of Map Illustrations

Non-mnemonic Representation

The non-mnemonic control maps contained realistic drawings of buildings, soldiers, weapons, etc. found in the time period. The symbols used on the map were selected in order to be more distinctive than many maps used in textbooks which use the same symbol (e.g., an explosion or fire) to represent the locations of the battles.



Ticonderoga



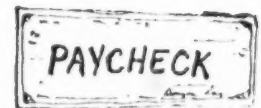
Paoli

Keyword Mnemonic Representations

The mnemonic map contained illustrations of the mnemonic-keywords for the names of the battles. Each keyword reconstructed the to-be-learned information into an acoustically similar term (the keyword) already known by the learner. At the time of retrieval, the student thinks of the keyword, recalls the keyword illustration and relocates the illustration on the map.



Ticonderoga
(Tiger)



Paoli
(Paycheck)

Reconstructive Elaborations

The elaborative map contained reconstructive elaborations of the battle names and information about an event associated with that battle or an outcome of the battle. The reconstructive elaboration depicted the illustration of the battle name keyword interacting with the event information. At the time of retrieval, the student thinks of the keyword, recalls the elaborative illustration and uses the interaction as a cue to recall the associated information. Map relocations are done using the image as in the mnemonic condition.



Ticonderoga
(Tiger)



Paoli
(Paycheck)